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December, 1923

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The Philippine Agriculturist

(University of the Philippines Publications: Series A)

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Authors of articles appearing in **The Philippine Agriculturist** are severally responsible for the opinions expressed therein.

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The
Philippine Agriculturist

Volume XII December, 1923 No. 7

THE OUTPUT OF THE COLLEGE OF AGRICULTURE

By C. F. Baker
Dean, College of Agriculture

"By their fruits ye shall know them." The College of Agriculture should be judged by its actual output. The output is of two sorts: First, and most important, is the human product; and second, the investigational and study results. The human product may be placed in three classes, the graduates forming two classes, and the short course students, one class.

Of great importance is that small group of graduates who have gone on into advanced work in America and who have obtained the best preparation that man can have in the special lines of agricultural sciences which they have chosen. This group is listed hereinafter as returned fellows. In my opinion, if the College had done no more than to produce this group, still it would have amply justified its existence, since in this group rests the possibility of carrying on the College of Agriculture and the great work which it represents.

The remaining graduates of the College represent the second most important group. The following list shows what has become of these graduates. During the earlier years of the College, the graduates were urgently sought for Government service, since Filipinos with this kind of preparation had not before existed in the country. As the requirements of the Bureaus became partly satisfied, more and more of the graduates turned to active private work, and numbers of them are now very successful farmers in many parts of the Islands. The College of Agriculture cannot produce one hundred per cent successes any more than can any other educational institution. All of the graduates of our best colleges of law and medicine are not successes. Also, it must be remembered in connection with the human product that its value cannot be gauged or realized upon, on short notice. We cannot teach common sense or mature judgment, nor endow any young man with sufficient working experience. The "University of Hard Knocks" must top off the work of the College of Agriculture, and we cannot estimate the real value of any man short of, say, five years after graduation. The possible usefulness of graduates of the College of Agriculture and the extent of fields in which they may serve has been greatly increased by the establishment of first class special courses in sugar technology and in animal husbandry.

The third class consists of the large proportion of the students, numbering several thousand young men, who have been at the College of Agriculture from one to three years but who did not graduate. These short-course men are now scattered all over the Islands, and a majority of them are in active private work.

Many of them have turned out great successes and some of them today are men of wealth—the majority of them doing their part in the material development of the Islands.

In spite of the fact that there has been no special support for Experiment Station work at the College of Agriculture, still the output in original results has been very considerable due to the permanent policy of the College in requiring every member of its faculty to be intellectually active and a producer of knowledge as well as a teacher. The attached list of experiment station contributions is ample evidence of the great extent and value of this output, and of the wisdom of the policy which has brought it about. The claim has been made in years gone by that opportunities for original work by Filipinos were greater at the College of Agriculture than in any other department of the Government, and the actual results would seem to bear this out.

FELLOWS AND PENSIONADOS OF THE COLLEGE OF AGRICULTURE RETURNED TO SERVICE

MANUEL L. ROXAS, Ph. D.,

Matriculated for graduate studies in the University of Wisconsin, July, 1914, receiving the degree of *Doctor of Philosophy* in 1916; special studies in Massachusetts Institute of Technology.

Professor of Chemistry, Acting Head of Department, College of Agriculture, University of the Philippines.

B. M. GONZALEZ, D. Sc.,

Matriculated for graduate studies in the University of Wisconsin, October, 1914, receiving the degree of *Master of Science*, 1916; *Professor of Animal Husbandry, College of Agriculture, University of the Philippines;* matriculated for additional graduate studies in Johns Hopkins University, May, 1921, receiving the degree of *Doctor of Science* (in Hygiene) in 1923.

Professor of Animal Husbandry, Head of Department, College of Agriculture, University of the Philippines.

N. B. MENDIOLA, Ph. D.,

Matriculated for graduate studies in Cornell University, August, 1916, receiving the degree of *Doctor of Philosophy* in 1918.

Associate Professor of Agronomy (Plant Breeding) *College of Agriculture, University of the Philippines.*

R. B. ESPINO, Ph. D.,

Matriculated for graduate studies in Johns Hopkins University, June, 1917, receiving the degree of *Doctor of Philosophy* in 1919.

Assistant Professor of Crop Physiology, College of Agriculture, University of the Philippines.

JOSÉ J. MIRASOL, Ph. D.,

Matriculated for graduate studies in University of Illinois, October, 1918, receiving the degree of *Doctor of Philosophy* in 1920.

Dean of the Junior College and Professor of Agriculture, University of the Philippines.

FRANCISCO A. QUISUMBING, Ph. D.,

Matriculated for graduate studies in Columbia University, September, 1918, receiving the degree of *Doctor of Philosophy* in 1921.

Assistant Professor of Chemistry, College of Liberal Arts, University of the Philippines.

L. B. UICHANCO, D. Sc.,

Matriculated for graduate studies in Bussey Institute, Harvard University, August, 1919, receiving the degree of *Doctor of Science* in February, 1922.

Assistant Professor of Entomology, Acting Head of Department, College of Agriculture, University of the Philippines.

FRANCISCO M. FRONDA, Ph. D.,
Matriculated for graduate studies in Cornell University, September, 1919, receiving the degree of *Doctor of Philosophy* in 1922.
Instructor in Poultry Husbandry, College of Agriculture, University of the Philippines.

F. O. SANTOS, Ph. D.,
Matriculated for graduate studies in Yale University, 1919, receiving the degree of *Doctor of Philosophy* in 1922.
Assistant Professor of Chemistry, College of Agriculture, University of the Philippines.

VALENTE VILLEGAS, Ph. D.,
Matriculated for graduate studies in Iowa State College, 1919, receiving the degree of *Doctor of Philosophy* in 1922.
Assistant Professor of Animal Husbandry, College of Agriculture, University of the Philippines.

ANASTASIO L. TEODORO, M. Sc.,
Matriculated for graduate studies in Cornell University, 1919, receiving the degree of *Master of Science* (in Agricultural Engineering) in 1921.
Instructor in Agricultural Engineering, College of Agriculture, University of the Philippines.

EDUARDO QUISUMBING, Ph. D.,
Matriculated for graduate studies in the University of Chicago, October, 1920, receiving the degree of *Doctor of Philosophy* in 1923.
Instructor in Plant Physiology, College of Agriculture, University of the Philippines.

GERARDO OFFIMARIA OCFEMIA, Ph. D.,
Matriculated for graduate studies in University of Wisconsin, 1920, receiving the degree of *Doctor of Philosophy* in 1923.
Instructor in Plant Pathology, Acting Head of Department, College of Agriculture, University of the Philippines.

CECILIO ALINCASTRE, M. S.,
Matriculated in Massachusetts Institute of Technology, 1920, receiving the degree of *Bachelor of Science* (in Mechanical Engineering).
Matriculated for graduate studies in Audubon Sugar School, 1922, receiving the degree of *Master of Science* in 1923.
Instructor in Sugar Technology, College of Agriculture, University of the Philippines.

TORIBIO VIBAR, Ph. D.,
Matriculated for graduate studies in the University of Illinois, 1921, receiving the degree of *Doctor of Philosophy* in 1923.
Assistant Professor of Agronomy, College of Agriculture, University of the Philippines.

ALUMNI OF THE COLLEGE OF AGRICULTURE[1]

CLASS OF 1911

Bachelor of Science in Agriculture

ROXAS, MANUEL L., M.S. (Univ. Phil.) Ph. D. (Univ. Wis.)
Professor of Agricultural Chemistry, Acting Head of Department, College of Agriculture, University of the Philippines, Los Baños, Laguna.

Bachelor of Agriculture

TEMPONGKO, CLODOALDO
Deceased.

ZAMORA, JOSÉ, *Master Farmer* (Univ. Phil.)
Farmer, Silang, Cavite.

CLASS OF 1912

Bachelor of Science in Agriculture

ALLAREY, VICENTE
Farm Adviser, Bureau of Agriculture, Lucena, Tayabas.

[1]The list was prepared by the Registrar, College of Agriculture (Registrar's Circular No. 42 s. 1923-24) from such records as were available. Corrections as to occupation and residence are requested.

Bachelor of Agriculture

ASUNCION, SILVESTRE, M.S. (Audubon Sugar School)
Sugar Technologist, Bureau of Agriculture, Manila.

CEVALLOS, FELIPE, M.S. (Univ. Wis.)
Occupation and residence unknown.

NAVARRO, ANDRES, M.D. (Univ. Phil.)
Captain, Philippine Constabulary, Baguio, Mt. Prov.

VIBAR, TORIBIO, B.S.A., M.S. (Univ. Phil.), Ph. D. (Univ. Ill.)
Assistant Professor of Agronomy, College of Agriculture, University of the Philippines, Los Baños, Laguna.

CLASS OF 1913

Master of Science

ROXAS, MANUEL L.
See Class of 1911, Bachelor of Science in Agriculture, supra.

Bachelor of Science in Agriculture

CRISOSTOMO, MARCELO
Farm Adviser, Bureau of Agriculture, Iloilo, Iloilo.

LEDYARD, EDGAR M.
Director, Agricultural Department, United States Smelting Co., Salt Lake City, Utah.

Bachelor of Agriculture

ALBANO, SOTERO F.
Fiber Inspector, Bureau of Agriculture, Vigan, Ilocos Sur.

BAGUI, FLORENCIO G.,
Principal, Farm School, Bureau of Education, Batangas, Batangas.

BARTOLOME, VICENTE C.
Assistant Chief, Fiber Division, Bureau of Agriculture, Manila.

GONZALEZ, BIENVENIDO M., M.S. (Univ. Wis.), D.Sc. (Johns Hopkins Univ.)
Professor of Animal Husbandry, Head of Department, College of Agriculture, University of the Philippines, Los Baños, Laguna.

LEJANO, ANTONIO
Fiber Inspector, Bureau of Agriculture, Manila.

MUÑOZ, APOLONIO R.
Farmer, Juban, Sorsogon.

VILLEGAS, VALENTE E., Ph.D. (Iowa State College)
Assistant Professor of Animal Husbandry, College of Agriculture, University of the Philippines, Los Baños, Laguna.

CLASS OF 1914

Bachelor of Science in Agriculture

MENDIOLA, NEMESIO B., M.S. (Univ. Phil.), Ph.D. (Cornell Univ.)
Associate Professor of Agronomy, College of Agriculture, University of the Philippines, Los Baños, Laguna.

Bachelor of Agriculture

ADRIANO, ALFREDO P.
Merchant, Tokyo, Japan.

CAMUS, JOSÉ S.
Assistant Chief, Division of Extension and Demonstration, Bureau of Agriculture, Manila.

GALANG, FRANCISCO
Chief, Division of Plant Industry, Bureau of Agriculture, Manila.

LAPARAN, AMANDO
Farm Adviser, Bureau of Agriculture, Santa Cruz, Laguna.

MERINO, GONZALO F.
Chief, Division of Pest Control, Bureau of Agriculture, Manila.

QUISUMBING, FRANCISCO A., M.S. (Univ. Phil.), Ph.D. (Columbia Univ.)
Assistant Professor of Chemistry, College of Liberal Arts, University of the Philippines, Manila.

SABLAN, ELADIO
Technical Employee, Fiber Division, Bureau of Agriculture, Manila.

TIRONA, JOSÉ P., M.D. (Univ. Phil.)
Farmer and Physician, Cavite.

ZULAYBAR, EUTIQUIO Q.,
Fiber Inspector, Bureau of Agriculture, Calbayog, Samar.

CLASS OF 1915

Bachelor of Science in Agriculture

ALDABA, VICENTE C., M.S. (Univ. Phil.)
Instructor in Agronomy, College of Agriculture, University of the Philippines, Los Baños, Laguna; Fellow at Lowell Textile School, Lowell, Mass.

AURELIO, CATALINO C.
Principal, Banga Agricultural School, Bureau of Education, Banga, Capiz.

DAÇANAY, JOSÉ Q.
Chief, Division of Publications, Bureau of Agriculture. Manila.

MIRASOL, JOSÉ J., M.S. (Univ. Phil.), Ph.D. (Univ. Ill.)
Dean, Junior College, University of the Philippines, Cebu, Cebu.

TEODORO, NICANOR, M.S., Ph.D. (Univ. Wis.)
Plant Pathologist, Bureau of Agriculture, Manila.

UICHANCO, LEOPOLDO B., M.S. (Univ. Phil.), M.S., Sc.D. (Harvard Univ.)
Assistant Professor of Entomology, Acting Head of Department, College of Agriculture, University of the Philippines, Los Baños, Laguna.

Bachelor of Science in Forestry

RACELIS, ANTONIO, M.S.F. (Mich. Univ.)
Forester, Bureau of Forestry, Manila.

VILLAMIL, ANICETO
Farmer, Oriental Negros.

Bachelor of Agriculture

CAPISTRANO, SEVERO M.
In Charge, Singalong Experiment Station, Bureau of Agriculture, Manila.

CONSTANTINO, AGRIPINO
Teacher, Rizal Provincial High School, Bureau of Education, Pasig, Rizal.

ESPINO, RAFAEL B., Ph.D. (Johns Hopkins Univ.)
Assistant Professor of Crop Physiology, College of Agriculture, University of the Philippines, Los Baños, Laguna.

GHOFULPO, TEODORO G.
Technical Employee, Binalbagan Sugar Central, Binalbagan, Occidental Negros.

LABAYAN, SEGUNDO D., M.S. (Audubon Sugar School)
Technical Employee, Talisay Sugar Central, Talisay, Occidental Negros.

MARQUEZ, FRANCISCO D.
Superintendent, La Carlota Experiment Station. Bureau of Agriculture, La Carlota, Occidental Negros.

MIRAFLORES, JOSÉ C.
Chemist, Manapla Sugar Central, Manapla, Occidental Negros.

MONTELLANO, PEDRO L., M.S. (Univ. Wis.).
Teacher, Central Luzon Agricultural School, Bureau of Education, Muñoz, Nueva Ecija.

OCFEMIA, GERARDO O., M.S. (Univ. Phil.), Ph.D. (Univ. Wis.)
Instructor in Plant Pathology, Acting Head of Department, College of Agriculture, University of the Philippines, Los Baños, Laguna.

OTUBRE, FRANCISCO P.
In Charge, Rosales Experiment Station, Bureau of Agriculture, Rosales, Pangasinan.

PANGANIBAN, ELIAS H., B.S.A., M.S. (Univ. Phil.)
Instructor in Chemistry, College of Agriculture, University of the Philippines, Los Baños, Laguna; Fellow in Cornell University, Ithaca, New York.

SARMIENTO, RAMÓN B.
Deputy Governor of Agusan, Butuan, Agusan.

VELEZ, BLAS C.
Technical Employee, Tanaraw Plantation Co., San José, Mindoro.

VICENCIO, ARSENIO S.
Farm Adviser, Bureau of Agriculture, Mexico, Pampanga.

VISTA, TOMAS I., M.S. (Univ. Phil.)
Farmer, Rizal, Laguna.

CLASS OF 1916

Master of Science

CLINTON, GUY, B.S. (Shenandoah Coll.)
Residence in the United States, occupation not reported.

ELAYDA, INOCENCIO, B.S.A. (Iowa State College)
Director of Extension Service, College of Agriculture, University of the Philippines, Los Baños, Laguna.

MENDIOLA, NEMESIO B.
See Class of 1914, Bachelor of Science in Agriculture, supra.

Bachelor of Science in Agriculture

PAGUIRIGAN, DOMINGO B., M.S. (Conn. Agr. Coll.)
Technical Employee, Bureau of Internal Revenue, Manila.

Bachelor of Agriculture

BACOMO, PANTALEON U.
Farm Adviser, Bureau of Agriculture, Puerto Princesa, Palawan.

BALANGUE, CORNELIO R.
Farm Adviser, Bureau of Agriculture, Tuguegarao, Cagayan.

CAGURANGAN, ALFONSO B.
Farm Adviser, Bureau of Agriculture, Ilagan, Isabela.

CONSTANTINO, MARCELINO
Farm Adviser, Bureau of Agriculture, Tansa, Cavite.

CONSUNJI, GAUDENCIO
Farmer, Hermon, Bataan.

CRUZ, FLORENTINO F., *Master Farmer* (Univ. Phil.)
Manager, Crescent Star Cattle Co., Dagumbaan, Bukidnon.

DAWIS, VICENTE M., B.S.A. (Univ. Phil.)
Assistant Farm Superintendent, College of Agriculture, University of the Philippines, Los Baños, Laguna.

LEON, JOSÉ DE
Superintendent, Lamao Experiment Station, Bureau of Agriculture, Limay, Bataan.

PALAFOX, GAUDENCIO
Superintendent, Damao Experiment Station, Bureau of Agriculture, Damao, Isabela.

SAN MIGUEL, LUCIO A.
Deceased.

CLASS OF 1917

Master Farmer

ZAMORA, JOSÉ
See Class of 1911, Bachelor of Agriculture, supra.

Master of Science

MIRASOL, JOSÉ J.
See Class of 1915, Bachelor of Science in Agriculture, supra.

Bachelor of Science in Agriculture

ABADILLA, FRANCISCO
Farmer, Lucena, Tayabas.

FRANCISCO, GREGORIO, *Master Farmer* (Univ. Phil.)
Farmer, Santa Rosa, Nueva Ecija.

GUTIERREZ, MARIANO E.
Deputy Governor of Cotabato, Cotabato, Cotabato.

MEDALLA, MARIANO, M.S. (Univ. Phil.)
Assistant Plant Pathologist, Bureau of Agriculture, Manila.

MENDOZA, LEOPOLDO G.
Farmer, Sagnay, Camarines.

SARAO, FELIX B., M.S. (Univ. Wis.)
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SILAYAN, HILARION
Student in the United States.

Bachelor of Agriculture

CALINGASAN, TEOFILO
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CLEMENTE, LEOPOLDO, Ph.D. (Univ. Ill.)
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EDROSO, LEON
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Farm Adviser, Bureau of Agriculture, Dumaguete, Oriental Negros.

GOCO, ARSENIO A.
Inspector, Division of Pest Control, Bureau of Agriculture, Manila.

GRAGEDA, GREGORIO
Teacher, Bureau of Education, Siassi, Jolo.

PASTORFIDE, DIONISIO B.
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PAULICAN, CENON
Manager, Dagumbaan Cattle Ranch, Dagumbaan, Bukidnon.

REYES, SIMEON
Inspector, Division of Pest Control, Bureau of Agriculture, Manila.

TUASON, DIONISIO
Deceased.

VILLYAR, PAULO
Technical Employee, Alabang Stock Farm, Bureau of Agriculture, Alabang, Rizal.

CLASS OF 1918

Master of Science

COCANNOUER, JOSEPH A., B. Agr.
Principal, High School, Chowchilla, California.

QUISUMBING, FRANCISCO A.
See Class of 1914, Bachelor of Agriculture, supra.

UICHANCO, LEOPOLDO B.,
See Class of 1915, Bachelor of Science in Agriculture, supra.

Bachelor of Science in Agriculture

BAUTISTA, PANTALEON
Farmer, Malabon, Rizal.

TRINIDAD, JOSÉ
Manager, Unson Coconut and Cattle Co., Parang, Cotabato.

Bachelor of Agriculture

AFRICA, EMILIO A.
Manager of..... Plantation, Hagonoy, Cotabato.

ARAGON, VICENTE
Farm Adviser, Bureau of Agriculture, Tarlac, Tarlac.

BAUTISTA, BASILIO
Farm Adviser, Bureau of Agriculture, Pasig, Rizal.

BAYLA, ARSENIO
Technical Employee, Bureau of Agriculture, Manila.

FESTIN, SANTIAGO
Farmer, residence unknown.

LAYOSA, PEDRO
Deceased.

MACASAET, VALENTIN
Agricultural Supervisor, Iwahig Penal Colony, Bureau of Prisons, Iwahig, Palawan.

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Inspector, Bureau of Agriculture, Malolos, Bulacan.

OTANES, FAUSTINO, B.A., M.S., Ph.D. (Univ. Ill.)
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PAZ, ALFONSO DE LA
Animal Husbandman, Lipa Experiment Station, Bureau of Agriculture, Lipa, Batangas.

QUISUMBING, EDUARDO, Ph.D. (Univ. Chicago).
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ROMERO, LEON
Farm Adviser, Bureau of Agriculture, San Carlos, Pangasinan.

SAMONTE, CLARO
Farm Adviser, Bureau of Agriculture, Bayombong, Nueva Viscaya.

SANTOS, FRANCISCO B.
Farm Adviser, Bureau of Agriculture, Laoag, Ilocos Norte.

SANTOS, GREGORIO
Technical Employee, Bureau of Agriculture, Manila.

TEODORO, ANASTASIO, M.S. (Cornell University)
Instructor in Rural Engineering, College of Agriculture, University of the Philippines, Los Baños, Laguna.

CLASS OF 1919

Master of Science

SANTOS, FRANCISCO O., A.B., B.S. (Univ. of Phil.)[1], Ph.D. (Yale Univ.)
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Bachelor of Science in Agriculture

CHANCO, ANTONIO R.
Technical Employee, Bureau of Agriculture, Manila.

HABALUYAS, RAMON K., M.S. (Univ. Phil.),
Chemist, Malabon Sugar Co., Malabon, Rizal.

VENTURA, TRANQUILINO
Chemist, Pampanga Sugar Development Co., San Fernando, Pampanga.

Bachelor of Agriculture

ADRIANO, FELIPE T., M.S. (Univ. Wis.)
Assistant Professor of Chemistry, College of Agriculture, University of the Philippines, Los Baños, Laguna.

ALCASID, EXEQUIEL
Superintendent, Alabang Stock Farm, Bureau of Agriculture, Alabang, Rizal.

CABANOS, JUAN B.
Technical Employee, Division of Plant Industry, Bureau of Agriculture, Manila.

COLLADO, ESTEBAN, B.S.A., M.S. (Univ. Phil.)
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DARIO, LEONCIO
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DAVID, PEDRO, B.S.A. (Univ. Phil.)
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ESGUERRA, JOSÉ P., B.S.A. (Univ. Phil.)
Animal Husbandman, College of Agriculture, University of the Philippines, Los Baños, Laguna.

FRONDA, FRANCISCO M., Ph.D. (Cornell Univ.)
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GONZALEZ, JOAQUIN
Farmer, Apalit, Pampanga.

HARDER, TOMAS
Farm Adviser, Bureau of Agriculture, Capiz, Capiz.

HERNANDEZ, NEMESIO
Technical Employee, Damao Experiment Station, Bureau of Agriculture, Damao, Isabela.

HIDALGO, VICENTE
Technical Employee, Alabang Stock Farm, Bureau of Agriculture, Alabang, Rizal.

LAGO, FRANCISCO P., B.S.A. (Univ. Phil.)
Animal Husbandman, College of Agriculture, University of the Philippines, Los Baños, Laguna.

LEAÑO, BENEDICTO C.
Technical Employee, Lamao Experiment Station, Bureau of Agriculture, Limay, Bataan.

LINDAYAG, GASPAR
Deceased.

LIPAYON, ANASTASIO
Student, University of California, Berkeley, California.

MANIO, MELECIO
Farm Adviser, Bureau of Agriculture, Dansalan, Lanao.

NARABAL, TIBURCIO
Farm Adviser, Bureau of Agriculture, Cagayan, Misamis.

NISCE, TEOFILO
Technical Employee, Fiber Division, Bureau of Agriculture, Manila.

NOGUERRA, JOSÉ
In Charge, Batangas Experiment Station, Batangas, Batangas.

PADOLINA, FELIPE
Technical Employee, Tanawan Experiment Station, Bureau of Agriculture, Tanawan, Batangas.

---

[1] College of Liberal Arts.

PERALTA, FERNANDO DE, B.S.A., M.S. (Univ. Phil.)
Assistant in Plant Physiology, College of Agriculture, University of the Philippines, Los Baños, Laguna.

RED, FRANCISCO R.
Farm Adviser, Bureau of Agriculture, Albay, Albay.

ROLDAN, EMILIANO, B.S.A., M.S. (Univ. Phil.)
Assistant in Plant Pathology, College of Agriculture, University of the Philippines, Los Baños, Laguna.

SABADO, RAYMUNDO, B.S.A. (Univ. Phil.)
Teacher, La Union Provincial High School, Bureau of Education, San Fernando, La Union.

SERRANO, FELICISIMO
Assistant Plant Pathologist, Bureau of Agriculture, Manila.

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Instructor in Chemistry, College of Agriculture, University of the Philippines, Los Baños, Laguna.

TORRES, JUAN
Student in the United States; Pensionado, Bureau of Agriculture.

VILLADOLID, DEOGRACIAS V., B.S.A., M.S. (Univ. Phil.)
Assistant in Entomology, College of Agriculture, University of the Philippines, Los Baños, Laguna.

YAP, GERMAN
Teacher, Bohol Provincial High School, Bureau of Education, Tagbilaran, Bohol.

ERESE, VALENTIN,
Deceased.

CLASS OF 1920

Master of Science

ALDABA, VICENTE C.
See Class of 1915, Bachelor of Science in Agriculture, supra.

MEDALLA, MARIANO
See Class of 1917, Bachelor of Science in Agriculture, supra.

OCFEMIA, GERARDO O.
See Class of 1915, Bachelor of Agriculture, supra.

VISTA, TOMAS I.
See Class of 1915, Bachelor of Agriculture, supra.

Bachelor of Science in Agriculture

DERECHO, ANTONIO
Farm Adviser, Bureau of Agriculture, Cebu, Cebu.

GUZMAN, ISIDORO
Farmer, Cabagan, Isabela.

JURADO, MARIANO
Technical Employee, Bureau of Agriculture, Manila.

MANIO, RAMON V.
Farmer, San Marcos, Bulacan.

PADLAN, POLICARPO
Technical Employee, Lipa Experiment Station, Bureau of Agriculture, Lipa, Batangas.

PANGANIBAN, SIMEON
Farmer, Lipa, Batangas.

PAULINO, PEDRO
Technical Employee, Bureau of Agriculture, Manila.

REYES, GAUDENCIO M.
Assistant Plant Pathologist, Bureau of Agriculture, Manila.

Bachelor of Agriculture

AFRICA, ANGEL, B.S.A., M.S. (Univ. Phil.)
Assistant in Physics, College of Agriculture, University of the Philippines, Los Baños, Laguna.

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CARANDANG, ATANACIO T., B.S.A. (Univ. Phil.)
Technical Employee, Calamba Sugar Estate, Canlubang, Laguna.

CATALAN, NEMESIO A., B.S.A. (Univ. Phil.)
First Lieutenant, Philippine Scouts, United States Army; Instructor in Military Science, College of Agriculture, University of the Philippines, Los Baños, Laguna.

Cazeñas, Gregorio D.
Teacher, Antique Provincial High School, San Fernando de Buenavista, Antique.

Clara, Feliciano H.
Assistant Pathologist, Bureau of Science, Manila.

Collado, Isidoro R.
Student, University of Denver, Denver, Colorado.

Corrales, José P.
Farmer, Mambajao, Misamis.

Elayda, Aniano R.
Technical Employee, Lamao Experiment Station, Bureau of Agriculture, Limay, Bataan.

Esguerra, Juan
Farm Adviser, Bureau of Agriculture, Bayombong, Nueva Ecija.

Estalilla, Hilarion H.
Inspector, Bureau of Agriculture, Vigan, Ilocos Sur.

Festin, Simplicio A.
Farmer, Odioñgan, Romblon.

Goseco, Andres P.
Manager, Ganadería Filipina, Guagua, Pampanga.

Isidro, Rufino
Technical Employee, Bureau of Agriculture, Manila.

Jamias, Julio M.
Teacher, Bureau of Education, Sanchez Mira, Cagayan.

Labrador, Anselmo F.
Technical Employee, La Carlota Experiment Station, Bureau of Agriculture, La Carlota, Occidental Negros.

Limbo, Anastasio
Technical Employee, Bureau of Agriculture, Malabalay, Bukidnon.

Lizaso, Juan G.
Technical Employee, Alabang Stock Farm, Bureau of Agriculture, Alabang, Rizal.

Lontok, Ambrosio M.
Farm Adviser, Bureau of Agriculture, Batangas, Batangas.

Lontok, Gregorio B., B.S.A. (Univ. Phil.)
In Charge, Citrus Project, United States Department of Agriculture, Los Baños, Laguna.

Luistro, Fernando
Technical Employee, Balactasan Scientific Center, Bureau of Education, Basilan, Zamboanga.

Maceda, Felix
Farm Adviser, Bureau of Agriculture, Tagbilaran, Bohol.

Mangonon, Alejandro S.
Residence in the United States; occupation unknown.

Mariano, Severo J.
Student in the United States.

Morada, Julian A.
In Charge, Ilagan Experiment Station, Bureau of Agriculture, Ilagan, Isabela.

Morada, Emilio K.
Technical Employee, Lamao Experiment Station, Bureau of Agriculture, Limay, Bataan.

Palafox, Serapio M.
Technical Employee, La Carlota Experiment Station, Bureau of Agriculture, La Carlota, Occidental Negros.

Pugeda, Melquiades S.
Farmer, Rosario, Cavite.

Ramos, Florentino
Deceased.

Rosales, Pedro S.
Farmer, Indang, Cavite.

Tomaneng, Roman C.
Teacher, Jaro Industrial School, Jaro, Iloilo.

Villanueva, Crispin B.
Technical Employee, Cotabato Experiment Station, Cotabato, Cotabato.

Villanueva, Leon B.
Deceased.

Villaraza, Mariano F.
Technical Employee, Fiber Division, Bureau of Agriculture, Manila.

CLASS OF 1921

Master of Science

PAÑGANIBAN, ELIAS H.
See Class of 1915, Bachelor of Agriculture, supra.

VIBAR, TORIBIO N.
See Class of 1912, Bachelor of Agriculture, supra.

Bachelor of Science in Agriculture (Supplementary)

CATALAN, NEMESIO A.
See Class of 1920, Bachelor of Agriculture, supra.

PAÑGANIBAN, ELIAS H.
See Class of 1915, Bachelor of Agriculture, supra.

VIBAR, TORIBIO N.
See Class of 1912, Bachelor of Agriculture, supra.

Bachelor of Science in Agriculture

ALLAS, TEOFILO B.
Tayug, Pangasinan; occupation unknown.

CHANDRASTITYA, IANG
Student, Cornell University, Ithaca, New York.

MEDINA, MELQUIADES L.
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MIÑANO, GERONIMO M.
Technical Employee, Bureau of Agriculture, Manila.

PEREIRA, EUFEMIANO DE BRAGANZA
Goa, Portuguese India; occupation unknown.

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Manager, Hacienda Angono, Angono, Rizal.

TALEON, ALEJO T., B.S.A., M.S. (Univ. Phil.)
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AQUINO, DIONISIO I., B.S.A. (Univ. Phil.)
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ASUNCIÓN, RODOLFO R.
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GRANO, MOISES S. DE
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MARQUEZ, SEVERO L.
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NERIC, JUAN I.
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REYES, RUFO
Farmer, Siniloan, Laguna.

REYES, TEODORICO P., B.S.A. (Univ. Phil.)
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RODRIGO, PEDRO A., B.S.A. (Univ. Phil.)
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SALINAS, LEONARDO
Technical Employee, Forestry Department of British North Borneo, Sandakan, Borneo.

SALVA-CRUZ, SEBASTIAN R.
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UNITE, JUAN O., B.S.A. (Univ. Phil.)
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URETA, ELIGIO C., B.S.A. (Univ. Phil.)
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ZABELLA, GAUDENCIO C.
Farmer, Tayabas, Tayabas.

CLASS OF 1922

Master of Science

HABALUYAS, RAMON K.
See Class of 1919, Bachelor of Science in Agriculture, supra.

Bachelor of Science in Agriculture (Supplementary)

AFRICA, ANGEL A.
See Class of 1920, Bachelor of Agriculture, supra.

CAPINPIN, JOSÉ M.
See Class of 1920, Bachelor of Agriculture, supra.

CARANDANG, ATANACIO T.
See Class of 1920, Bachelor of Agriculture, supra.

COLLADO, ESTEBAN G.
See Class of 1919, Bachelor of Agriculture, supra.

DAVID, PEDRO A.
See Class of 1919, Bachelor of Agriculture, supra.

DAWIS, VICENTE M.
See Class of 1916, Bachelor of Agriculture, supra.

ESGUERRA, JOSÉ P.
See Class of 1919, Bachelor of Agriculture, supra.

LAGO, FRANCISCO P.
See Class of 1919, Bachelor of Agriculture, supra.

PERALTA, FERNANDO DE
See Class of 1919, Bachelor of Agriculture, supra.

ROLDAN, EMILIANO F.
See Class of 1919, Bachelor of Agriculture, supra.

SABADO, RAYMUNDO A.
See Class of 1919, Bachelor of Agriculture, supra.

SULIT, VICTOR S.
See Class of 1919, Bachelor of Agriculture, supra.

VILLADOLID, DEOGRACIAS V.
See Class of 1919, Bachelor of Agriculture, supra.

Bachelor of Science in Agriculture

BABAO, SANTIAGO
Farmer, Batangas, Batangas.

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SANCHEZ, ANTONIO G.
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Bachelor of Agriculture

ABRAJANO, QUIRICO F., B.S.A. (Univ. Phil.)
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ALMAZAN, PASCUAL A.
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AQUINO, SEVERINO S.
Farmer, San Carlos, Pangasinan.

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BAGUI, CRISPULO G.
Farmer, Batangas, Batangas.

BUENAVENTURA, AGAPITO E.
Teacher, Catarman Agricultural School, Bureau of Education, Catarman, Samar.

COLLADO, TOMAS, B.S.A. (Univ. Phil.)
Technical Employee, Calamba Sugar Estate, Canlubang, Laguna.

CORCINO, BALTAZAR A.
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CUITIONG, RUFINO
Deceased.

DADUFALZA, TOMAS D., B.S.A. (Univ. Phil.)
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Occupation unknown; residence unknown.

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[1] College of Liberal Arts.

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Marilao, Venerando P.
Technical Employee, Philippine Sugar Centrals Agency, Pulupandan, Occidental Negros.

Mendoza, Francisco M.
Technical Employee, Isabela Sugar Central, Isabela, Occidental Negros.

Moncerate, Benito N.
Farmer, San Joaquin, Iloilo.

Novero, Teofilo F.
Assistant in Agronomy, College of Agriculture, University of the Philippines, Los Baños, Laguna.

Padilla, Bonifacio
Teacher, Central Luzon Agricultural School, Muñoz, Nueva Ecija.

Peliño, Anacleto R.
Teacher, Manila City Schools, Manila.

Peña, Daniel B., B.S.A. (Univ. Phil.)
Assistant in Animal Husbandry, College of Agriculture, University of the Philippines, Los Baños, Laguna.

Piguing, Rafael M., B.S.A. (Univ. Phil.)
Assistant in Agronomy, College of Agriculture, University of the Philippines, Los Baños, Laguna.

Ponce, Basilio F.
Teacher, Bureau of Education, Manila.

Pulgar, German M.
Teacher, Pangasinan Provincial High School, Bureau of Education, Lingayen, Pangasinan.

Punzalan, Edilberto S.
Assistant in Agronomy, College of Agriculture, University of the Philippines, Los Baños, Laguna.

Rocafort, Antonio L., B.S.A. (Univ. Phil.)
Assistant in Physics, College of Agriculture, University of the Philippines, Los Baños, Laguna.

Rodis, Filoteo B., B.S.A. (Univ. Phil.)
Deceased.

Roque, Damaso C.
Technical Employee, Calamba Sugar Estate, Canlubang, Laguna.

Sagun, Casamiro B. de, B.S.A. (Univ. Phil.)
Occupation unknown; residence unknown.

Sarmiento, Valeriano M.
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Serrano, Ciriaco B.
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Soriano, Antonio M.
Teacher, Pangasinan Provincial High School, Bureau of Education, Lingayen, Pangasinan.

Telado, Felix S.
Technical Employee, Department of Agriculture, Sandakan, British North Borneo, Borneo.

Viado, Basilio O.
Teacher, Indang Farm School, Bureau of Education, Indang, Cavite.

CLASS OF 1923

Master Farmer

Cruz, Florentino F.
See Class of 1916, Bachelor of Agriculture, supra.

Francisco, Gregorio
See Class of 1917, Bachelor of Science in Agriculture, supra.

Master of Science

Africa, Angel A.
See Class of 1920, Bachelor of Agriculture, supra.

Capinpin, José M.
See Class of 1920, Bachelor of Agriculture, supra.

Collado, Esteban G.
See Class of 1919, Bachelor of Agriculture, supra.

GONZALEZ, LEON G.
See Class of 1922, Bachelor of Science in Agriculture, supra.

PERALTA, FERNANDO L. DE
See Class of 1919, Bachelor of Agriculture, supra.

ROLDAN, EMILIANO F.
See Class of 1919, Bachelor of Agriculture, supra.

SULIT, VICTOR S.
See Class of 1919, Bachelor of Agriculture, supra.

TALEON, ALEJO T.
See Class of 1921, Bachelor of Science in Agriculture, supra.

VILLADOLID, DEOGRACIAS V.
See Class of 1919, Bachelor of Agriculture, supra.

Bachelor of Science in Agriculture (Supplementary)

ABRAJANO, QUIRICO F.
See Class of 1922, Bachelor of Agriculture, supra.

AGATI, JULIAN A.
See Class of 1921, Bachelor of Agriculture, supra.

AQUINO, DIONISIO I.
See Class of 1921, Bachelor of Agriculture, supra.

BERNARDO, FRANCISCO R.
See Class of 1921, Bachelor of Agriculture, supra.

CARAY, ELIAS M.
See Class of 1921, Bachelor of Agriculture, supra.

CENDAÑA, SILVERIO M.
See Class of 1921, Bachelor of Agriculture, supra.

ESTRADA, ALBERTO A.
See Class of 1922, Bachelor of Agriculture, supra.

DADUFALZA, TOMAS D.
See Class of 1922, Bachelor of Agriculture, supra.

GOCO, LORENZO L.
See Class of 1922, Bachelor of Agriculture, supra.

JIMENEZ, ALEJO L.
See Class of 1921, Bachelor of Agriculture, supra.

LASERNA, ERNEDO T.
See Class of 1922, Bachelor of Agriculture, supra.

LONTOK, GREGORIO B.
See Class of 1920, Bachelor of Agriculture, supra.

MANZA, ARTEMIO V.
See Class of 1921, Bachelor of Agriculture, supra.

PEÑA, DANIEL B.
See Class of 1922, Bachelor of Agriculture, supra.

PIGUING, RAFAEL M.
See Class of 1922, Bachelor of Agriculture, supra.

REYES, ANTONIO S.
See Class of 1921, Bachelor of Agriculture, supra.

REYES, TEODORICO
See Class of 1921, Bachelor of Agriculture, supra.

RODIS, FILOTEO B.
See Class of 1922, Bachelor of Agriculture, supra.

RODRIGO, PEDRO A.
See Class of 1921, Bachelor of Agriculture, supra.

SAGUN, CASIMIRO B. DE
See Class of 1922, Bachelor of Agriculture, supra.

SOLIVEN, FLORENCIO A.
See Class of 1921, Bachelor of Agriculture, supra.

UNITE, JUAN O.
See Class of 1921, Bachelor of Agriculture, supra.

URETA, ELIGIO C.
See Class of 1921, Bachelor of Agriculture, supra.

Bachelor of Science in Agriculture

ANTENOR-CRUZ, GREGORIO J.
Technical Employee, Hacienda Filomena, Isabela, Occidental Negros.

Aquino, Emilio Cabreza
Farmer, Pagsanjan, Laguna.

Bengson, Arturo
Student, College of Law, University of the Philippines, Manila.

Celis, Eugenio D.
Teacher, Bureau of Education, Manila.

Crisanto, José
Teacher, Manila North High School, Bureau of Education, Manila.

Cruz, Segundo Manuel
Teacher, Rizal Provincial High School, Bureau of Education, Pasig, Rizal.

Jaojoco, Felipe M.
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Juliano, José B.
Assistant in Plant Physiology, College of Agriculture, University of the Philippines, Los Baños, Laguna.

Leoncio, Martin O.
Assistant in Chemistry, College of Liberal Arts, University of the Philippines, Manila.

Mabbun, Pablo N.
Assistant in Economics, College of Agriculture, University of the Philippines, Los Baños, Laguna.

Olofernes, Bernabe Agero
Teacher, Cebu Provincial High School, Bureau of Education, Cebu, Cebu.

Opiana, Gil O.
Assistant in Chemistry, College of Agriculture, University of the Philippines, Los Baños, Laguna.

Reyes, José Chico
Teacher, Pampanga Provincial High School, Bureau of Education, San Fernando, Pampanga.

Rowan, Anastasio A.
Teacher, Guimbal Intermediate School, Bureau of Education, Guimbal, Iloilo.

Sadorra, Nazario M.
Teacher, Central Luzon Agricultural School, Bureau of Education, Muñoz, Nueva Ecija.

Talento, Apolinar S.
Teacher, Bureau of Education, Manila.

Teruel, Eusebio Taleon
Teacher, Iloilo Provincial High School, Bureau of Education, Iloilo, Iloilo.

Tuason, Nicasio A.
Technical Employee, Fortich's Ranch, Dalirig, Bukidnon.

Zamuco, Calixto T.
Occupation unknown; residence, Aguilar, Pangasinan.

Bachelor of Agriculture

Acuña, Eulogio M.
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Carreon, Felix D.
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Cruz, Ramón A.
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Flores, Geronimo L.
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Lomibao, Patricio
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Lopez, Enrique
Farmer, Quingua, Bulacan.

Malabanan, Pedro L.
Farmer, Lipa, Batangas.

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CLASS OF 1924—(Ad interim)

Bachelor of Science in Agriculture (Supplementary)

HERNANDEZ, BASILIO
See Class of 1922, Bachelor of Agriculture, supra.

ROCAFORT, ANTONIO L.
See Class of 1922, Bachelor of Agriculture, supra.

PUBLISHED CONTRIBUTIONS FROM THE COLLEGE OF AGRICULTURE

I: TECHNICAL CONTRIBUTIONS 1909-1918.[1]

(1) COPELAND, E. B. The ferns of the Malay-Asiatic region, Part I. Philippine Journal of Science **4C**: 1-66. *Pl. 1-21.* 1909.

(2) COPELAND, E. B. New or interesting Philippine ferns, IV. Philippine Journal of Science **4C**: 111-116. 1909.

(3) COPELAND, E. B. Additions to the Bornean fern flora. Philippine Journal of Science **5C**: 283-286. 1910.

(4) COPELAND, E. B. Papuan ferns collected by the Reverend Copland King. Philippine Journal of Science **6C**: 65-92. 1911.

(5) COPELAND, E. B. Bornean ferns collected by C. J. Brooks. Philippine Journal of Science **6C**: 133-144. *Pl. 1-14.* 1911.

(6) COPELAND, E. B. New or interesting Philippine ferns, V. Philippine Journal of Science **6C**: 145-148. 1911.

(7) COPELAND, E. B. Cyatheae species novae orientales. Philippine Journal of Science **6C**: 359-364. 1911.

(8) FRANCO, FELIX. Rice growing in Pampanga. Philippine Agriculturist and Forester **1**: 7-8. 1911.

(9) ZAMORA, JOSÉ. Leptocorisa acuta. Philippine Agriculturist and Forester **1**: 8-9. 1911.

(10) ROXAS, M. The pandan industry in Majayjay. Philippine Agriculturist and Forester **1**: 11-12. 1911.

(11) DURHAM, S. B. Some practical advice on horse breeding in the Philippines. Philippine Agriculturist and Forester **1**: 13-14. 1911.

(12) COPELAND, E. B. Maniok varieties. Philippine Agriculturist and Forester **1**: 22. 1911.

(13) COPELAND, E. B. Root crops. Philippine Agriculturist and Forester **1**: 23. *Pl. 1-6.* 1911.

(14) COPELAND, E. B. Taal and agriculture. Philippine Agriculturist and Forester **1**: 24-26. 1911.

(15) NAVARRO, ANDRES F. Some local insects of economic importance. Philippine Agriculturist and Forester **1**: 32-35. *Pl. 1-2.* 1911.

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[1]The list was prepared by the Registrar, College of Agriculture, (Registrar's Circular No. 41, s. 1923-1924), and contains the technical contributions of the faculty and students of the College published prior to the establishment, in 1919, of the Experiment Station. The contributions are numbered serially as reported.

(16) Vibar, T. N. The establishment of a vegetable garden. Philippine Agriculturist and Forester **1**: 38-39. *Pl. 1.* 1911.

(17) Copeland, E. B. Caiñgins. Philippine Agriculturist and Forester **1**: 43. *Pl. 1.* 1911.

(18) Copeland, E. B. Physiology of the coconut. Philippine Agriculturist and Forester **1**: 44-50. 1911.

(19) Cruz, Mariano Manas. Live stock farming and soils. Philippine Agriculturist and Forester **1**: 54-55. 1911.

(20) Roxas, Manuel. The cultivation of coconut. Philippine Agriculturist and Forester **1**: 57-60. 1911.

(21) Copeland, E. B. Abaca. Philippine Agriculturist and Forester **1**: 64-73. 1911.

(22) Cevallos, Felipe O. Spraying tests of some common insecticides on farm crops. Philippine Agriculturist and Forester **1**: 74-77. 1911.

(23) Vibar, Toribio N. The management of garden soil. Philippine Agriculturist and Forester **1**: 79-81. 1911.

(24) Cevallos, Felipe O. Control of diseases and pests by cultural methods. Philippine Agriculturist and Forester **1**: 86-88. *Pl. 1.* 1911.

(25) Roxas, Manuel. The effect of some stimulants upon rice. Philippine Agriculturist and Forester **1**: 89-97. 1911.

(26) Villegas, V. Silkworm culture. Philippine Agriculturist and Forester **1**: 119. 1911.

(27) Franco, Felix. Lumbering in Bataan. Philippine Agriculturist and Forester **1**: 132-134. 1911.

(28) Bagui, Florencio. Black pepper in Batangas. Philippine Agriculturist and Forester **1**: 136. 1911.

(29) Durham, S. B. Scale of points for Philippine pony. Philippine Agriculturist and Forester **1**: 138-139. 1911.

(30) Copeland, E. B., and Roxas, M. The coffee industry in the island of Luzon. Philippine Agriculturist and Forester **1**: 145-152. 1911.

(31) Zamora, José. Fertilizers and the growth of rice. Philippine Agriculturist and Forester **1**: 152-154. 1911.

(32) Cevallos, Felipe O. The effect of shade on the environment of the abaca plant and on the plant itself. Philippine Agriculturist and Forester **1**: 161-167. 1911.

(33) Vibar, Toribio N. The influence of K-P-N on the growth and production of maize. Philippine Agriculturist and Forester **1**: 175-187. 1911.

(34) Baguisi, Alberto. Liñga. Philippine Agriculturist and Forester **1**: 187. 1911.

(35) Copeland, E. B. The genus Thayeria. Philippine Journal of Science **7C**: 41-46. *Pl. 1.* 1912.

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III: GENERAL CONTRIBUTIONS[1]

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THE VITAMIN B CONTENT OF SOME PHILIPPINE FRUITS AND VEGETABLES[1]

By Eulogio M. Acuña

INTRODUCTION

It is generally recognized that plants form the best source of certain dietary essentials which we now call the vitamins. In the Philippines, fruits and vegetables abound all the year round and for this reason people are inclined to think that little attention need be paid to the problem of procuring diets which will furnish these essentials. "This, however, is not invariably the case" (1). In spite of the availability of fruits and vegetables all the year round, deficiency diseases have occurred and are occurring among the Filipino people.

At present the chemistry laboratory in this College is engaged in a systematic study of the nutrition of the Filipino people and for this reason "it becomes highly desirable that vitamin tests be made on the fruits and vegetables which are being or may be eaten by them" (1).

Probably the first systematic investigation of the vitamin content of Philippine food materials was made by Santos (1) who determined the vitamin B content of *togi* (sprouted mungo), okra, avocado, mango, sweet potato leaves, duhat (*Eugenia jambolana* L.), artichokes, bilimbi (*Averrhoa carambola* L.), banana flower bud, and bamboo shoots. He also showed that the vitamin C in *togi* is destroyed in the culinary preparation. Embrey (2) recently determined the presence of vitamin C in pummelo, cucumber, chico, guava, banana, lanzon, cankong (*Ipomœa reptans* (L.) Poir) and camote (sweet potato) leaves.

Johns, Finks, and Paul (3) found copra meal to be rich in vitamin B and somewhat deficient in vitamin A; and Derecho (4) found it to be poor in vitamin C. Recently it has been suggested that copra meal be used by the Filipinos as source of protein, but in the light of the findings in this laboratory (unpublished) we hesitate to recommend that this suggestion be followed. It is thus seen that only a very limited number of Philippine fruits and vegetables has been examined for their vitamin content.

It was the object of this investigation to determine the comparative vitamin B content of some Philippine fruits and vegetables not yet studied.

The present work was carried out in the College of Agriculture, Los Baños, for a period of about seven months beginning in August, 1923.

MATERIALS AND METHODS

Thus far the only method known for the determination of the presence of vitamin is biological and this is the method used in the present investigation.

White rats were used as the experimental animals. They were grouped into pairs (a male and a female) of about the same age. Each animal was kept in a separate cage, but once a week each pair was put together for at least five hours to enable them to breed. The animals were weighed once a week.

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[1]Thesis presented for graduation from the College of Agriculture, No. 162; Experiment Station contribution No. 197. Prepared in the Department of Chemistry under the direction of Dr. Manuel L. Roxas and Dr. F. O. Santos.

THE FEED

The experimental diet consisted of a basal ration plus the vegetable or fruit as supplement. Water extract of egg yolk was used as control source of vitamin B.

Basal ration.—The basal ration had the following composition:

Polished rice	69
Casein (washed)	15
Butter fat	10
Salt mixture (McCollum and Davis) (5)	4
Filter paper	2

The polished rice was ground fine; the casein was washed thoroughly with water, at least five times, and then ground. The filter paper was first macerated, then pressed and dried. In the course of drying the small pieces were separated. Butter fat from high quality butter was used. The salt mixture was prepared according to McCollum and Davis) (5):

Sodium chloride	5.00	grams
Dipotassium phosphate	12.10	"
Primary calcium phosphate-monohydrate	2.56	"
Calcium lactate	29.44	"
Iron citrate	1.00	"

Supplements.—The fruits tested for vitamin B were the following;

Banana, *Musa sapientum*
Papaya, *Carica papaya*
Paayap, *Vigna sinensis*

The fruits were analysed for proximate composition at the Experiment Station Food Laboratory and the results are shown in the following tabulation:

	Moisture.	Fat.	Ash.	Protein.	Crude fiber.	Carbohydrates.
Paayap	89.59	0.37	0.21	3.06	1.64	5.13
Banana	72.14	0.48	0.84	0.97	0.51	25.06
Papaya	87.72	5.16	0.53	0.23	2.68	3.59

In preparing the food mixture, the required amount of the supplements was weighed fresh and then mixed with the basal ration just before feeding.

Control source of vitamin B.—Yolk of hard boiled egg was macerated with from 30 to 60 per cent alcohol, stirred for about twenty minutes and allowed to settle. The supernatant liquid was separated and distilled until all the alcohol was removed. Then it was evaporated on a water bath to the desired concentration, that is, when the resulting liquid would hardly flow on inclining the container.

The feed was weighed daily. Unless otherwise specified the animals were given boiled water *ad libitum.*

EXPERIMENTAL

CONTROL FEEDING

To determine that the basal ration prepared as described above is really deficient in vitamin B, a pair (155 ♀ and 135 ♂) was given this ration alone. The animals decreased in weight. Then water extract from one-half gram of egg yolk was given daily to each animal in addition to the basal ration. The extract was diluted with water and the calculated amount of basal ration which a rat took daily was moistened with it. On this improved ration Rat No. 135 ♂ recovered part of its weight; when the supplement was increased to two grams daily complete recovery ensued. Rat No. 155 ♀ on one-half gram supplement showed great increase in weight; but later decreased and then again increased when the supplement was made two grams daily. The animals' food intake was very low with the basal ration alone, but with the supplement their appetite improved decidedly.

TEST FOR VITAMIN B

Papaya.—Three pairs of rats were given the basal ration plus fresh papaya in doses of 10, 20, and 40 grams. These amounts were used following the results of preliminary trials in which several pairs were given varying amounts of papaya. It was found that 40 grams of this fruit was the largest quantity that a rat would take daily with the basal ration.

10-gram supplement.—From August 13 to September 12, Rats 130 ♂ and 123 ♀ were given 1 gram papaya as daily supplement. On September 13 the supplement was increased to 2 grams; on September 23, to 4 grams; on September 27, to 5 grams; on September 30, to 6 grams; on October 30, to 7½ grams; and finally to 10 grams from November 27 to February 18.

On a supplement of 1 gram daily, Rat 130 ♂ decreased rapidly in weight. It recovered gradually when the supplement was successively increased to 2, 4, 5, 6, and 7½ grams. But even when the supplement was increased to 10 grams the rat was not able to recover its original weight though it was kept on the last supplementary dose for 3 months.

Rat 123 ♀, also decreased in weight when given only 1 gram of the fruit a day as supplement, but gradually improved when the supplement was increased to 2, 4, 5, 6, and 7½ grams. When the supplement was increased to 10 grams it gained a little above its initial weight.

20-gram supplement.—At the beginning of the experiment Rats 124 ♂ and 99 ♀ received 4 grams of papaya as daily supplement. On September 12, this was increased to 5 grams; on September 23, to 8 grams; on September 27, to 10 grams; on September 30, to 12½ grams; and on October 5, to 15 grams. Finally the supplement was increased to 20 grams on November 27. This last supplementary dose was given until February 18.

Rat 124 ♂ on the varying amount of supplement mentioned at first decreased in weight and then later took on more than its original weight. On the same supplementary dose Rat 99 ♀ also declined at first and then recovered.

40-gram supplement.—Rats 125 ♂ and 100 ♀ were given papaya as supplement in varying amounts and on the same dates, but the amounts were twice those given to Rats 124 ♂ and 99 ♀. Both animals increased markedly in weight.

Banana.—As in the preceding experiment with papaya, fresh banana was used as supplement in varying amounts. It was found that 20 grams of this fruit was the maximum an animal would take in addition to the basal ration. So, for the 3 pairs that received banana as supplement, the amounts given were 5, 10, and 20 grams respectively.

5 grams as supplement.—From August 13 to September 2, Rats 150 ♂ and 136 ♀ were each given 1 gram of banana as daily supplement to the basal ration. On September 3 the supplement was increased to 4 grams; on September 17, to 5 grams; and on September 27, to 7½ grams. Finally, on October 9, it was reduced to 5 grams. This was given until February 18.

At first, Rat 150 ♂ decreased in weight, but when larger doses of banana were given there was a corresponding increase in weight of the animal. When the dose was again reduced to 5 grams there was a slight decrease in weight, but this was recovered later and the rat continued to grow.

Rat 136 ♀ also decreased in weight at first and then gradually increased until the final weight was appreciably greater than the original.

10 grams of banana as supplement.—From the beginning of the experiment on August 13, pair 151 ♂ and 137 ♀ was given 5 grams of banana as daily supplement to the basal ration for each animal. On September 3 the amount was increased to 8 grams; to 10 grams on September 17; to 15 grams on September 27; and then reduced to 10 grams on October 9. This amount was given daily until February 18.

Rat 151 ♂ first decreased in weight. When larger doses of banana were given the weight showed marked increases.

Rat 137 ♀ first increased in weight, then continued decreasing even when the amount of banana given was increased. However, after a time the animal began to gain weight though in a very gradual manner.

20 grams as supplement.—From August 13 to September 2, Rats 153 ♂ and 119 ♀ each received 10 grams of banana as daily supplement to the basal ration. On September 3, 16 grams were given; 20 grams on September 17; 30 grams on September 27; and 20 grams on October 9.

Rat 153 ♂ decreased in weight until the banana given was increased to 16 grams on September 16, when it began to take on weight. The increase continued as the amount of banana given was increased; but when on October 9 the dose was reduced from 30 to 20 grams, the animal lost weight, but only for a brief period as it afterwards regained the weight lost.

Rat 119 ♀ with 10 grams of banana as supplement increased in weight at first, then declined, but took on weight again. When the supplement was increased to 16 grams, there was practically no growth, but when the dose was increased to 20 grams and later to 30 there was an increase in weight.

Paayap (*Vigna sinensis*).—The three pairs of rats that were used in this experiment previously received different rations. Rats 154 ♂ and 121 ♀ were given basal ration alone. Rats 129 ♂ and 122 ♀ were getting the basal ration plus papaya. And Rats 152 ♂ and 138 ♀ were taking the basal ration plus banana.

The paayap used was the variety most commonly eaten by the people in this locality. Care was taken to use only green and tender pods which were cut

into small pieces and then boiled. The broth was diluted with a little water and given to the animals for drinking.

Beginning on September 10 these three pairs of rats were given varying amounts of paayap as daily supplement to the basal ration. On September 23 the giving of fixed amounts of daily supplement began.

5-gram supplement.—Pair 154 ♂ and 121 ♀ had already declined in weight on the basal ration before paayap was given. After three months on the supplementary doses of paayap both animals weighed more than their initial weight at the beginning of the feeding with basal ration alone.

10-gram supplement.—Pair 129 ♂ and 122 ♀ had already declined in weight on the basal ration plus insufficient amount of papaya as supplement. When the papaya was replaced by paayap both rats increased in weight over their initial weights at the beginning of the experiment.

20-gram supplement.—Rats 138 ♂ and 152 ♀ increased greatly in weight on this supplementary dose of paayap.

DISCUSSION OF RESULTS

PAPAYA

The weekly body weights and food intake of the animals are given in Tables I to IV. The body weights are also represented graphically in Chart I.

From an examination of the chart and also of Table II, it can be seen that on a supplementary dose of 10 grams the animals were just able to maintain their weights, but when the papaya supplement was increased to 20 or 40 grams the animals greatly increased in weight. This shows that the supplementary dose of 10 grams is about enough for maintenance and that 20 and, of course, 40 grams would be sufficient for growth.

BANANA

Table III shows that all of the animals had practically the same amount of food intake and that whatever difference there was in growth was due to the banana supplement.

On the least supplementary dose of 5 grams daily the animals increased in weight over the initial. Similar increases in weight were obtained with 10 and 20 grams of banana as daily supplementary dose.

PAAYAP

The results obtained are similar to those obtained with banana, although more pronounced. All of the animals were able to increase their weight above that at the beginning of the experiment.

Compared with the same amount of banana, paayap seems to be a better source of vitamin B, for the animals fed this increased in weight faster than the animals that were given corresponding amounts of banana.

As will be noted none of the rats reproduced during the experimental period. It is not believed that these animals were really unproductive for the stock from which they were taken are still breeding and some of them had reproduced before they were used in this work. It is hardly possible to say that this lack of

fertility is due to the diet, although it is now known that the substance X (6) is necessary to fertility and the production of healthy young.[2]

SUMMARY AND CONCLUSIONS

1. Paayap was found to be a good source of vitamin B. Five grams of the boiled fresh paayap were enough to promote normal growth when used as a supplement to a standard ration deficient in vitamin B.

2. Banana also contains an appreciable amount of vitamin B. Five grams as supplement to the basal ration are not as efficient to promote growth as paayap, but 10 grams are sufficient for normal growth.

3. Papaya, likewise, contains vitamin B but in a smaller amount than either the banana or the paayap. Twenty grams of this fruit are needed as daily supplement to the basal ration to promote normal growth of the rats.

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[2] For lack of space, the animals were kept in a place adjoining an analytical laboratory at the beginning of the experiment. Hydrogen sulphide gas and acid fumes quite often invaded the room where the rats were kept. It was soon noticed that the gases were having a deteriorating effect on the animals as judged from the ragged appearance of the control which was receiving a complete diet. Upon this discovery the animals were transferred to a room far from the chemistry building when the appearance of the control improved in a very marked way. It may be possible that the action of the gases and the fumes may have had some permanent effect on the fertility of the animals.

TABLE I.—*Control: Body weight and weekly intake of basal diet.*

Feeding period 1922-1923.	135 ♂		155 ♀	
	Body weight.	Diet.	Body weight.	Diet.
	gm.	*gm.*	*gm.*	*gm.*
August 13	——	——	160	——
August 20	213	——	155	——
August 27	194	——	150	——
September 3	160	10	140	20
September 10	136	20	118	10
September 17	107x	10	112x	20
September 24	123	40	130	50
October 1	129	57	150	84
October 8	150	76	175	118
October 15	162	79	182	79
October 22	167	79	185	69
October 29	173	60	191	55
November 5	179	60	182	58
November 12	175	50	180	72
November 19	170	50	176	44
November 26	156	57	164	47
December 3	153	60	167	62
December 10	159	72	176	84
December 17	159	70	177	66
December 24	176	70	185	76
December 31	170	82	180	78
January 7	170	78	175	78
January 14	160	74	172	72
January 21	160	45	165	45
January 28	131y	25	161y	55
February 4	175	84	194	93
February 11	204	123	208	100
February 18	221	96	213	101

NOTE:—*Key to tables*:

x = extract of one-half gram of egg yolk was given as supplement.
y = extract of two grams of egg yolk was given as supplement.
v = fixed amount of supplement was given.

TABLE II.—*Papaya: Body weight and weekly intake of basal diet.*

Feeding period 1922-23.	10 gram supplement.				20 gram supplement.				40 gram supplement.			
	130 ♂		123 ♀		124 ♂		99 ♀		125 ♂		100 ♀	
	Body weight.	Diet.	Body weight.	Diet.	Body weight.	Diet.	Body weight.	Diet.	Body weight.	Diet.	Body weight.	Diet.
	gm.	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*
August 13	215	—	195	—	—	—	—	—	—	—	—	—
August 20	210	—	185	—	—	—	—	—	—	—	—	—
August 27	192	—	170	—	—	—	—	—	—	—	—	—
September 3	180	20	143	10	183	20	177	20	180	50	167	32
September 10	164	30	134	25	178	30	164	25	172	40	146	15
September 17	155	35	128	30	162	30	147	30	159	55	146	55
September 24	163	58	147	70	170	54	157	36	184	70	163	55
October 1	165	65	163	80	176	56	172	70	190	80	188	100
October 8	171	65	179	100	183	55	175	90	205	70	208	110
October 15	175	65	185	65	190	55	184	65	214	70	215	80
October 22	176	60	185	63	196	62	185	57	225	77	225	75
October 29	176	53	188	60	199	60	191	50	231	75	238	63
November 5	171	47	191	47	197	55	189	50	233	65	254	70
November 12	166	60	189	58	198	71	188	56	234	69	232	65
November 19	169	50	192	50	204	57	188	43	234	57	235	70
November 26	168v	57	189v	55	201v	59	183v	50	222v	66	230v	52
December 3	170	34	194	70	207	60	193	45	232	70	225	55
December 10	183	75	192	60	221	80	189	49	245	93	229	55
December 17	191	72	198	72	235	85	194	60	254	94	243	75
December 24	199	80	208	69	242	74	197	69	264	80	254	85
December 31	194	50	206	62	235	69	202	59	262	75	256	78
January 7	186	71	207	76	231	78	201	69	261	65	251	61
January 14	184	69	213	71	241	86	203	67	270	86	250	45
January 21	184	69	205	65	242	89	200	65	267	85	253	70
January 28	185	74	204	60	244	94	199	60	268	86	249	75
February 4	194	73	207	65	247	85	201	55	277	60	253	40
February 11	196	75	207	70	255	75	205	60	278	70	254	55
February 18	198	70	207	65	255	80	209	60	286	59	265	65

TABLE III.—*Banana: Body weight and weekly intake of basal diet.*

Feeding period 1922-23.	5 gram supplement.				10 gram supplement.				20 gram supplement.			
	150 ♂		136 ♀		151 ♂		137 ♀		153 ♂		119 ♀	
	Body weight.	Diet.	Body weight.	Diet.	Body weight.	Diet.	Body weight.	Diet.	Body weight.	Diet.	Body weight.	Diet.
	gm.	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*
August 13	210	—	—	—	201	—	135	—	239	—	200	—
August 20	202	—	—	—	200	—	151	—	238	—	210	—
August 27	194	—	—	—	185	—	156	—	215	—	205	—
September 3	180	45	170	55	175	28	155	35	210	35	195	30
September 10	187	50	162	45	178	48	152	40	217	50	195	45
September 17	190	80	159	20	185	65	150	35	231	75	199	65
September 24	204	73	165	50	205	81	155	65	246	67	209	56
October 1	211	75	168	60	213	68	155	45	258	65	215	40
October 8	219v	80	175v	60	219v	79	157v	35	265v	60	219v	30
October 15	210	75	170	50	215	60	157	35	256	80	218	25
October 22	212	67	177	68	219	60	161	48	261	67	218	37
October 29	221	68	187	71	224	67	167	35	256	52	221	35
November 5	221	75	182	50	226	65	164	45	268	80	223	40
November 12	220	87	186	64	223	69	166	65	274	89	223	47
November 19	226	69	182	43	224	54	168	40	282	60	228	43
November 26	229	74	184	46	230	74	165	40	280	68	221	35
December 3	234	94	183	55	243	82	163	45	283	81	228	60
December 10	244	78	190	65	251	80	173	45	300	85	237	45
December 17	248	88	186	50	252	83	168	50	300	63	238	50
December 24	256	74	193	57	258	86	176	40	311	80	244	59
December 31	243	75	201	71	247	62	175	45	308	69	240	45
January 7	238	82	194	73	248	76	175	70	308	84	245	57
January 14	246	81	195	64	255	72	175	55	326	86	250	50
January 21	241	84	188	60	246	75	170	45	318	65	240	50
January 28	236	89	187	65	248	75	169	45	317	60	236	55
February 4	245	71	195	55	254	58	175	45	321	57	244	34
February 11	249	90	191	50	251	70	171	50	325	75	239	50
February 18	255	80	191	50	250	65	175	45	328	70	245	50

TABLE IV.—*Paayap: Body weight and weekly intake of basal diet.*

Feeding period 1922-23.	5 gram supplement.				10 gram supplement.				20 gram supplement.			
	154 ♂		121 ♀		129 ♂		122 ♀		152 ♂		138 ♀	
	Body weight.	Diet.	Body weight.	Diet.	Body weight.	Diet.	Body weight.	Diet.	Body weight.	Diet.	Body weight.	Diet.
	gm.	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*
August 13	—	—	—	—	200	—	225	—	186	—	165	—
August 20	—	—	—	—	201	—	221	—	203	—	180	—
August 27	175	—	198	—	195	—	200	—	195	—	175	—
September 3	165	15	167	15	180	25	172	15	189	40	176	40
September 10	156	35	143	10	163	25	159	15	190	45	167	40
September 17	173	90	178	70	183	85	179	55	216	80	176	65
September 24	206	135	212	135	205	110	209	140	243	110	184	89
October 1	212	92	228	115	214	75	215	95	260	116	184	70
October 8	218v	85	228v	95	223v	85	215v	65	267v	100	192v	65
October 15	222	90	227	80	223	75	217	75	267	85	194	75
October 22	223	84	230	76	228	84	225	86	281	84	198	71
October 29	228	80	233	60	238	75	231	80	288	82	201	60
November 5	226	82	227	65	240	75	233	70	290	85	205	72
November 12	229	86	228	69	243	86	240	85	299	102	208	76
November 19	229	77	232	70	246	72	245	77	309	83	216	62
November 26	225	72	235	70	250	74	240	65	313	79	218	60
December 3	234	94	242	83	250	80	244	65	317	103	218	59
December 10	243	100	246	73	265	90	246	70	334	105	228	79

KEY TO CHART

- - - - - - - - = growth on basal diet alone

———— = growth on basal diet plus vitamin supplement in varying amount

— • — • — = growth on basal diet plus fixed amount of vitamin supplement

A DESCRIPTION OF A FOUR-LEGGED CHICK[1]

By Manuel D. Sumulong

Of the College of Veterinary Science

WITH TWO PLATES

While examples of various types of malformations of the extremities in mammals, ranging from total or partial lack of members to supernumerary limbs and digits, are on record, yet, so far as I am aware, there has not been a case recorded in the fowls analogous to the specimen here described. The presence of supernumerary legs in fowls, though not an unusual occurrence, especially in the chickens, is rare enough to make it of some interest, from the anatomical point of view at least.

The specimen that is the subject of the following account was given to the writer by Mr. Deogracias Villadolid of the Department of Zoology and Entomology, College of Agriculture. Judging from the size of the animal and character of the feathers it must have lived for about three weeks.

With reference to the anatomical peculiarities this chick monster closely resembles the six-legged dog described by Horseley (1) and the six-legged rat described by Conrow (2).

In the study of this chick monster the following authors were consulted: Wilder (3); Tannreuter (4); Mitchell (5); Mall (6); Alsop (7); Parker (8); Hargitt (9); Lillie (10); Bailey and Miller (11); Kellicott (12); Mall (13); Chauveau (14); and Adami and McCrae (15).

EXTERNAL CHARACTERS

In Plate I the right lateral aspect of the chick in its actual size after death is shown. This chick presented two extra legs, otherwise it appeared normal both in size and body conformation. The extra legs appeared as if they hung directly from the posterior part of the body, but after closer examination of the neighboring parts it was found that they were suspended from the body by means of a slender bar of bony structure which was sparsely covered with young feathers. Both legs were smaller than the corresponding normal legs and both of them were directed obliquely downward to the left. The right extra leg was deformed and very much shorter than the left component. The right first digit was absent; the rest of the digits appeared proportionally normal but showed no indication at all that they had ever been used during life.

After the removal of the feathers closer examination of the perineal region (see Plate II, fig. 1) revealed that the slender bar, which measured two and a half centimeters in length and which was directed obliquely downward to the right, represented the fused thighs of the supernumerary limbs. The proximal half of the anterior surface of the fused thighs was united to the perineal region by a fold of integument. At their proximal extremity a somewhat triangular eminence could be palpated, which upon dissection proved to be a rudimentary

[1]Experiment Station contribution No. 198.

pelvis. The left component of the extra pair of legs formed an angle of about 65 degrees with the fused thighs, and stretching from its proximal half to the whole length of the fused thighs and the eminence was a fold of integument, the presence of which undoubtedly made the extension of the leg impossible.

Two ani were present, the functional and the false. The functional anus was pushed toward the right of the median line by the rudimentary pelvis, and its opening was twice as wide as that of the false anus. The latter was located just at the left side of the base of the eminence, about two thirds of a centimeter left of the vertebral axis. It was directed toward the left rather than caudad, and on probing, it proved to be unperforated.

The uropygium was also slightly displaced toward the right, and this slight displacement seemed to be due to the pressure exerted by the rudimentary pelvis.

INTERNAL FEATURES

Careful and systematic dissection proved that this chick was partly double, and the structures most concerned in the duplication were the distal part of the alimentary tract, the pelvic girdle and the legs; the rest of the structures appeared perfectly normal for a single individual. The skeletal conditions in the pelvic region are illustrated in Plate II, fig. 2. Two pelves were present, the left one being the smaller and rudimentary. The pubic bones of the rudimentary pelvis and the left sacrum were absent. The ilia fused dorsally in the median line to form a single bone, and ventro-laterally the anterior and posterior parts of their lateral border were fused with the corresponding ischial bone. The ischium, on the other hand, fused ventrally with its fellow in the median line. At the point where the ilial and ischial bones failed to fuse was a slit-like opening (one on each side) through which passed the blood vessels and nerves for the supernumerary legs. This opening on either side of the rudimentary pelvis seemed to represent the obturator foramen. The arrangement, given above, of the os coxae gave the rudimentary pelvis the appearance of a blunt cone having an opening on either side. The anterior margin of the right ilium was connected to the ventral surface of the caudal vertebrae by means of a short thin ligament, and the anterior portion of the corresponding ischium projected into the normal pelvic cavity, interposed between the two branches of the rectum which will be alluded to later. The anterior borders of the fused ilium and ischium were continued in front by means of an irregularly triangular plate of cartilage which was firmly attached to the posterior border of the left pubic and ischial bones of the normal pelvis. Bounded in front by the posterior border of the left ilium of the normal pelvis and behind by the anterior borders of the fused ilia of the rudimentary pelvis was a somewhat elliptical opening through which passed the false anus.

The femurs of the extra pair of hind limbs were fused along their whole extent to form a single bone. These fused femurs were four millimeters shorter than either of the normal femurs, being eighteen centimeters in length. They were flattened dorsoventrally and their distal extremity was twice as wide as the proximal which measured eight millimeters in its broadest part. The characteristic head and trochanters of the femur were not evident. Superiorly the fused femurs articulated with the ventral surface of the apex of the cone-like rudimentary pelvis; the joint they formed fell in the category of amphiarthrosis. The fused femurs were at right angles with the pelvis.

The right tibia was very much deformed and twisted and measured only eight millimeters in length in contrast with twenty-five millimeters of its fellow on the opposite side. The left tibia was three millimeters shorter than either of the normal ones. The right fibula was absent. The two tibial bones articulated above with the ventral side of the distal extremity of the fused femurs, each forming an immovable joint (syndesmosis). The stifle joints of the supernumerary legs were bound together by a sheath of fibrous connective tissue and integument.

Both the right and left metatarsal bones were of the same length and two millimeters shorter than the normal ones which measured twenty millimeters in length. The joints they formed with the corresponding tibial bones were also of immovable type. All the bones of the developed digits of the extra feet were apparently normal.

It is interesting to note that the supernumerary structures described above were not provided with well organized muscles; only fibrous connective tissue strands mixed with some muscle fibers could be recognized under the integument. More muscle fibers were found in the bundles of fibrous connective tissue that stretched from the perineal region to the ventral surface of the fused femurs. The tendons of the extensor and flexor muscles of the digits were fairly well developed and could be easily dissected in the region of the lower third of the metatarsal bones. This absence of well organized muscles in the extra hind legs strongly suggests that these legs, besides being non-functional, were not under the control of the animal during life.

The digestive tract and the glands associated therewith cephalad of the point where the caeca joined the rest of the intestinal tract presented no appreciable abnormality, but caudad of the caecal openings the rectum became gradually enlarged, the diameter of its broadest part being three times that of its anterior connection, the ilium. At one and a half centimeters from the junction of the caeca and the ilium the dilated rectum bifurcated into two unequal diverging branches. The left branch was the non-functional and it was only one-half the diameter of the right branch. It was three millimeters shorter than the right or functional branch, the latter being nine millimeters in length. Neither the functional nor the non-functional branch presented any appreciable distal enlargement to indicate the characteristic cloaca.

Only the right kidney and testis were present and their ducts emptied into the functional branch of the rectum; no trace of any duct could be found communicating with the non-functional branch.

The blood supply of the rudimentary pelvis and the two extra legs was derived from a small artery that arose from the caudal artery. This branch of the caudal artery pursued a course toward the left and entered the cone-like rudimentary pelvis. On reaching the level of the foramen referred to above it became divided into two principal branches, each of which passed through the foramen on the corresponding side. Both branches broke into smaller branches which ramified the legs. The left lumbosacral plexus gave rise to a small nerve which coursed backward along with the branch of the caudal artery and became distributed in the extra legs.

CONCLUSIONS

The monster chick here reported falls in the category of duplicate monsters and apparently corresponds to the dipygus type of mammalian monsters. Look-

ing at the double portion of this chick the right component appears as fully developed and normal in position, whereas the left component is very rudimentary and lies almost wholly to the left of the median line. With the anatomical data furnished by this chick it is very difficult to decide definitely whether the condition was brought about by the fusion of two originally distinct anlagen or by the splitting of the posterior part of a single anlage. However, the fact that the supernumerary structures received their blood supply from a branch of the caudal artery and their nerve supply from a nerve arising from the left lumbo-sacral plexus, and the fact that only the right kidney and testis were present, it seems that this is a case of the splitting of the caudal portion of a single anlage. The split must have occurred at the time the leg and tail buds were beginning to manifest themselves. It is very probable that the split did not occur symmetrically, and that probably would account for the absence of the left kidney and testis and for the comparatively small size of the left component.

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ILLUSTRATIONS

Plate I

Fig. 1.—Actual size of chick after death. Showing 1, right; 2, left, supernumerary legs: 3, right, and 4, left normal legs.

Plate II

Fig. 1.—Drawing of the hind part of the chick after the removal of feathers to illustrate the relation of the supernumerary legs to the body. 1, slender bar of bony structure; 2, triangular eminence at the proximal extremity of the bar; 3, fold of integument stretching from the proximal half of the left leg to the bar and triangular eminence; 4, functional anus; 5, non-functional or false anus; and 6, uropygium.

Fig. 2.—Drawing of the dorsal aspect of the pelvic region to show the skeletal conditions. 1, left rudimentary pelvis; 2, 2′, left and right ilia; 3, left ischium of the rudimentary pelvis; 4, foramen (obturator); 5, triangular plate of cartilage connecting the left ilium and ischium of the rudimentary pelvis and the left pubic and ischial bones of the normal pelvis; 6, opening through which passed the false anus; 7, fused femurs; 8, right tibia; 9, 9′, right and left stifle joints; 10, 10′, left and right metatarsal bones.

Fig. 3.—Drawing of the distal part of the intestinal tract showing the duplication of the distal part of the rectum. 1, rectum; 2, junction of the caeca and the ilium; 3, 3′, right and left caeca; 4, ilium; 5, left non-functional branch of the rectum; and 6, right functional branch of the rectum.

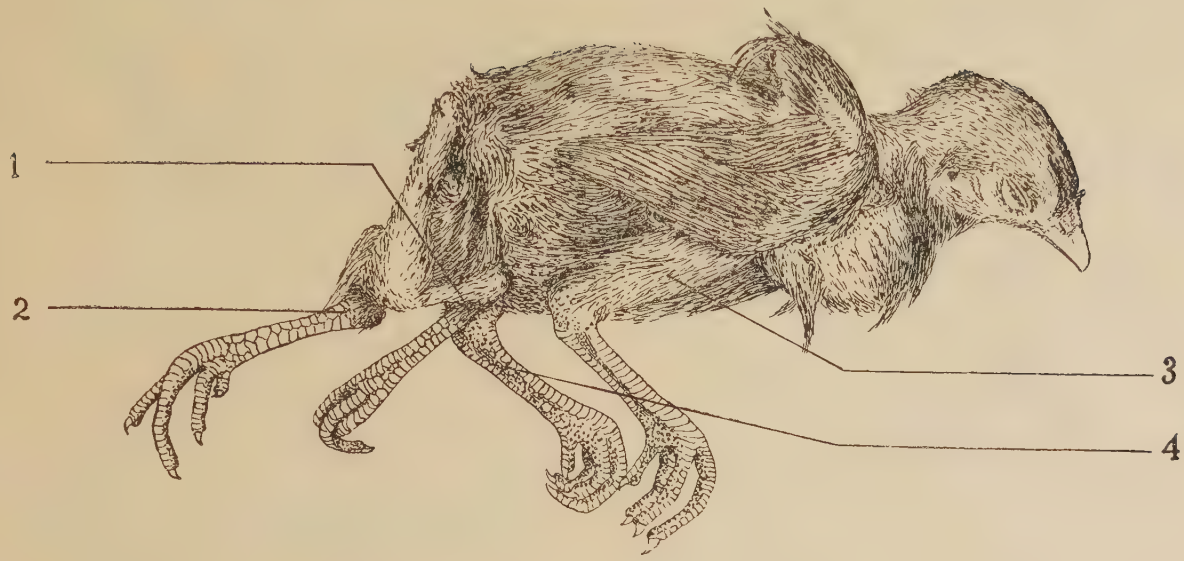

PLATE I

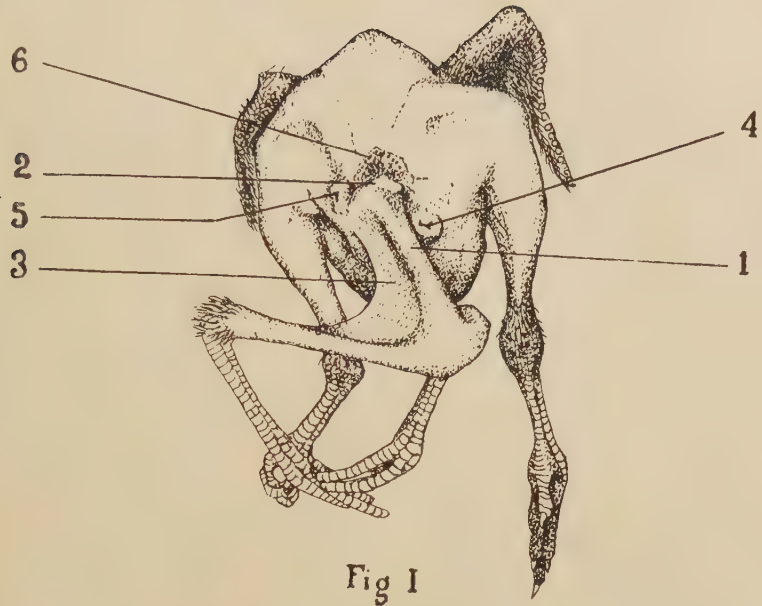

Fig 1

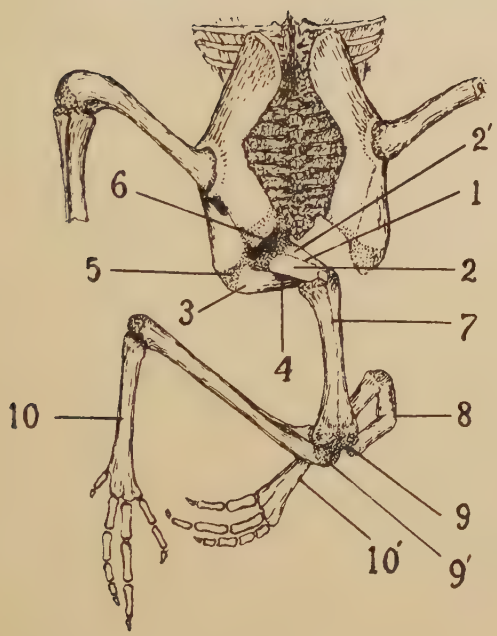

Fig 2

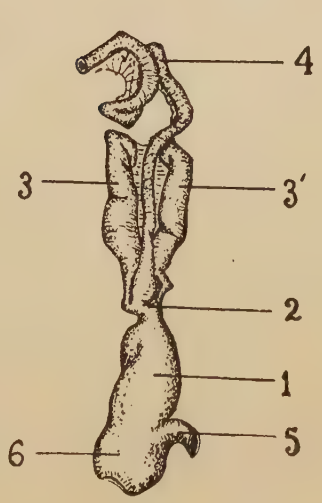

Fig 3

PLATE II

ABSTRACT[1]

An investigation on the profit and loss of the caiñgin culture, GERMAN M. PULGAR (*Thesis presented for graduation from the College of Agriculture, No. 163; Experiment Station contribution No. 199*).—*Caiñgin* culture is the most primitive method of growing rice in the Philippine Islands. The operation consists of clearing the ground and making holes in the soil in which the seeds are dropped.

This investigation was undertaken in 1920-1921 in Tanay, Rizal Province. The essential parts of the report are:

1. The *caiñgin* farmers estimate size of farms in terms of gantas (1.72 kg.) of seed planted.

2. Average yield of rough rice (*palay*) from one ganta of seed was two cavans (one cavan = 25 gantas, or 43 kg.).

3. To handle one ganta of seed and its produce requires about 63 hours of labor.

4. *Caiñgin* culture does not pay well. In the year 1920, 52 per cent, and in 1921, 80 per cent of the farms incurred losses varying from ₱0.50 to ₱114.00 while the rest made net profit ranging from ₱0.31 to ₱180.00.

5. Planting minor crops between the rice growing seasons gave better returns than growing rice alone.

Abstract by Thongdee Resanont.

[1] Abstract prepared as part of required theme work in English 101, College of Agriculture.

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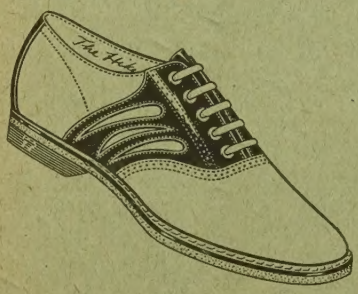

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